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Transmission of Traditional Agricultural Knowledge: Intergenerational or International? Examining Youth's Involvement in Agriculture

Georgia Elgar
SIT Study Abroad

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I. Abstract

In the Earth's changing ecological and economic climates, traditional, ecosystem-specific, culture-specific systems of agriculture has more value than ever before for rural India. Children's involvement in agricultural work is an important variable in the preservation of such systems. With urban migration of young people and increases in formal education leading to non-farm employment, detailed agricultural knowledge such as soil and water conservation, non-chemical methods of pest control, and are rapidly fading with each generation. This descriptive study aimed to explore and understand the ways in which youth participation in farm work contributes to the preservation of traditional agricultural knowledge in rural village communities of Kangra District, Himachal Pradesh. Key questions to answer were: What is the overall picture of agriculture/food production in the community? How exactly are youth involved? What are the community perspectives in the value of youth's contribution? How is this contribution crucial in preserving and *practicing*, specifically, traditional agricultural techniques? Results of the study were extensive; while traditional knowledge is transferred largely through an intergenerational learning chain, it was found that traditional knowledge is not an end goal in itself, rather a tool, among many, which can be used to maintain economically, culturally, and environmentally sustainable agricultural systems.

II. Introduction

In India, neoliberal policy and industrialized agriculture is causing the loss of community-level agricultural knowledge, which is one invaluable tool in combatting the changing ecological and economic climate that is currently leading to system collapse. About 65% of all Indian citizens still live in rural areas and depend directly on the land for sustenance. By the year 2020, India will have the youngest population on the planet (Patel 2013). Understanding how the nation's youth contribute to the conservation (or erosion) of agricultural traditional knowledge is an indispensable area of contemporary social research. This study, completed in District Kangra, rural Himachal Pradesh, sheds light on the nature of agricultural knowledge transmission and, more broadly, the cultural attitudes currently in place the promote (or stigmatize) youth employment in agriculture.

Agriculture has been the primary occupation and lifestyle for the majority of citizens of the Indian subcontinent for thousands of years. Due to relative isolation and boundaries of human technology prior to recent years, farmers have maintained necessarily closed-system plots that utilize biological and cultural materials found in their immediate surroundings. With the onset of India's Green Revolution in the 1960's and 1970's, which stressed industrial, input-intensive methods to achieve national food-grain security, and the rewiring of economic policy in the 1980's and 1990's away from subsistence-based, traditional economies like agriculture toward services, globalization, and "modernization," farmers depending more and more on external agricultural inputs like chemical fertilizers, pesticides, tractors, and hybrid or transgenic seeds to maintain land that yields enough to compete in the increasingly globalized market. Today, about 70% of Indians remain in rural areas, most of whom depend directly on the land ("India: Priorities"), but the fact is that India is experiencing an agrarian crisis. Despite aforementioned technologies providing an initial increase in production (Chakravarti 1973), repeated use of such simplified, linear systems are

proving detrimental in the long term. Pests and weeds are ever more tolerant to chemical control methods, returning with increased gusto every season. Continuous monocultures deplete the soil of nutrients and reduce biodiversity. The use of hybrid seed, which by its nature cannot be saved, removes the possibility for crop species to evolve and adapt with the changing climates. Today, agricultural production is undergoing an overall decline and agroecosystems are at risk of collapse.

Globally, concern about an ongoing and accelerating loss of cultural wisdom or knowledge and systems of learning this knowledge has been expressed. Traditional knowledge can also contribute to societal change toward more holistic, ethical values. Oli and Dhakal define traditional, or indigenous, knowledge in their paper on the Himalayas as: "the knowledge, innovation, and practices of indigenous and local communities around the world…developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation," (2008). This study adopts this definition and the terms "indigenous knowledge" and "traditional knowledge" will be used interchangeably.

The documentation and revitalization of traditional agricultural knowledge serves as a way to preserve alternatives to the industrial status quo today in a future that needs alternatives. The vital mechanism by which this study conceptualizes traditional knowledge loss is through a concept known as the *intergenerational learning chain*, a linear, vertical system of knowledge transfer from parent to child. In many ways, this chain has been disrupted by "the erosion of…cultural erosion and disintegration of joint family systems," (Singh 2010). The intergenerational learning chain is a key connecting point through which knowledge is transferred and lens through which this study understands indigenous knowledge transfer. If younger generations do not receive and absorb, the wisdom of their parents, that knowledge stands to be lost.

Numerous studies have sought to document this knowledge and its importance. In the Himalayas, the history and use of various water collection and diversion systems, local methods of beekeeping for honey and pollination, spreading of ash for weed control, and the use of the Ayurvedic growth stimulant and biopesticide, *panchagavya,* are all significant examples of recording traditional knowledge (PSI 2003; Lal et. al. 2008; Kumar & Lourduraj 2005). These practices and thousands more like it not only reinstate cultural pride and greater community resilience in the face of global acculturationand invasion of economically globalizing forces, but it has potential to combat global environmental issues such as climate change, soil erosion, and water scarcity.

Many have also looked to understand just *how* the system behind learning this knowledge is preserved. Much research suggests that women are the key knowledge holders and are the primary means of knowledge transmission, which begins at an early age and continues through adulthood. One study in an indigenous community of Patagonia found that generational spread of traditional plant knowledge begins at an early age through "vertical transmission," meaning parent to child transmission but are influenced by many transmitters throughout life (Eyssartier et. al 2008). Cruz-Garcia analyzes the "mother-child nexus", in the context of wild food plant collection in the Western Ghats, India. There, both practices and values pertaining to wild food plants are transmitted simultaneously. For example, children learn that the plants are healthy and that they are symbols of low status and poverty (Cruz & Garcia 2006).

Even if knowledge transmission is indeed secure, one's perception of *value* of the knowledge and farming as an enterprise itself is equally as important. Unfortunately, a major result of the precarious agricultural situation across India is that farmers and farmers' children are migrating to non-farm employment such as construction, trade, or other services to support their families. Recent developments show that India is experiencing a decline in

the absolute number of farmers (Sharma 2007). The government's eleventh five-year plan aims to encourage private sector job creation for educated youth and the average age of agricultural workers is much greater than for workers in other jobs (Gale & Fahey 2005). Young people are now growing up with an emphasis on excelling in locally-detached formal education (encourages them to do other things) as a mere means to get a better-paying, more secure job rather than on learning the land-based trade of their parents or grandparents. This not only breaks the intergenerational learning chain, but prevents children from the opportunity to become proud, competent, self-motivated adults that meaningful work creates. In a community of Uttarakhand, for example, some children make significant family contributions by harvesting "mukku," a profitable lichen harvested from the forest, which allows them a sense of self-control that homework does not (Dyson 2008).

In Himachal Pradesh, the location of study, 42.36% of the population is youth (aged 15-34) (Patel 2013). With such an enormous figure, there is correspondingly enormous potential for the nation's rural youth to trade the stagnant waters of industrial agriculture for the fresh waters of an appropriate mix of inherently sustainable traditional knowledge and methods and innovative, progressive techniques. This qualitative study originally aimed to explore and understand the ways that youth participate in farm work, what value this participation has for the community, and how that contributes to the preservation of traditional agricultural knowledge. However, the data collection period brought to light many more factors that provide insight to the youth generation and future of farming, which are discussed in the findings and results section. This paper is organized into two overarching discussion sections. First will be an examination of the nature of young people's involvement in agriculture in the area of study, including how and why it takes the form it does. Second, youth's importance in traditional agricultural knowledge in the area of study is written,

understood through three key frameworks of tradition: biodiversity maintenance, traditional wild animal and pest control, and innovative technologies.

A. Scope and Methodology

This three-week qualitative study was completed in coordination with the Chinmaya Mission for Rural Development (CORD) at their training centre in Sidhbari, District Kangra, Himachal Pradesh (HP) (Figure 1). CORD completed a private random-sampling analysis on the agricultural scenario in Kangra District, which provides context to the specific geographical areas of this particular study. The study found that average land holding per household is 3 to 4.5 *kanals* (See Appendix B), and that just 3% of farmers have surplus production (CORD Study). This signifies that the average household land holding of this study is larger and has a greater surplus than the district average. The Jadrangal Panchayat in District Kangra, where CORD maintains a strong rapport and works closely with farmers, was chosen as one geographical focus for study, though data was also collected from two other villages, Jamanabad and Manaal. Based on findings of this particular study, these three villages have higher than district-average implementation of "progressive" and government-sanctioned techniques including system of crop intensification, vermicompost pits, backyard dairy sale, and "knowledge of good seed varieties". This is likely a result of CORD's influence. Cluster sampling was utilized in Jadrangal; the goal of this study was to interview members of two

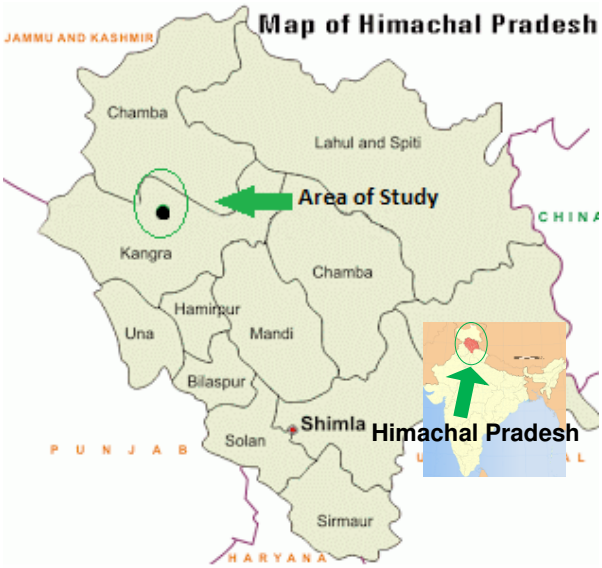

Figure 1. Map of Himachal Pradesh. Kangra District in mid-hill zone Himalayas. Black dot designates CORD Sidhbari. Green Circle denotes encompasses an area including Manaal, Jamanadad, and Jadrangal villages.

farm families from each of five wards of Jadrangal Panchayat, but time allowed for more than two families per ward on average. Families were chosen in each ward based on convenience of the families.

Due to varying levels of involvement based on age, young people were divided into two categories—age 13 and under (hereafter referred to as *children*) and age 14 to 30 (hereafter referred to *youth*). Because careful observation of those families who do involve their children in work showed that the degree and nature of work involvement transforms around age 12-13 from one of playful and light work to one of chore and genuine necessity.In India, interviewing children under age 18 is prohibited in research, therefore various alternative methods were used to get a holistic sense of the community perceptions on value of all ages of youth in agriculture, including direct observation as well as participatory observation via three-day rural homestay. A prior study indicated that social research on traditional knowledge necessitates a less rigid, direct interview process. It pointed to the "semi-direct interview" in which interviewer may have prepared a list of discussion themes, but the "direction and scope of the interview are allowed to follow the participants' train of thought" and should be ready for unanticipated associations made by respondents (Huntington 2000). In the field, the appropriateness of this form of interview quickly became evident and twenty semi-directed interviews with mothers, fathers, grandparents, and young people aged 18-30 (all from farm families) were conducted (See Appendix A).

Further, an interview with a key informant, Mr. Onkar Singh, coordinator of the Farm and Allied Sector of CORD Sidhbari, was conducted to at the start of study period to understand the local situation from the point of view of someone who has worked with farmers in villages for years. Two focus group discussions were also conducted—one with members of a Farmer Club of Jadrangal Panchayat, Ward #4, and one with the CORD Sidhbari workers (all male) of the Farm & Allied Sector. Interviews and focus groups

occurred in respondents' homes and fields with the assistance of a translator, where discussion could be most comfortable.

III. Farm Basics in Geographical Focus: Jadrangal Panchayat

In the Jadrangal village, the smallest amount of land held was 2.5 kanals and the largest was 50 kanals (about 2 hectares). The average median land holding among farm families who responded was 8 kanals. The entire area works land atop terraced agricultural systems, which date back at least one thousand years based on archaeological excavations (PSI 2003). The average farmer in Jadrangal grows almost everything required for domestic consumption, including vegetables, grains, dairy, meat, fruits from trees, as well as firewood, timber, and fodder. If possible, they sell any surplus (usually *aloo*, wheat, or rice) in local markets, though many do not have that level of production and at times may even purchase required food. Most farmers in Jadrangal maintain one or more animal species on their farm, most often a cow for milk and at times bulls or oxen, goats, sheep, and chickens. With animals, fodder species are also maintained and farmyard manure (FYM) is collected or, in some cases, purchased, and spread as a natural fertilizer in fields. Many also practice seed saving in combination with the purchase of high-quality or hybrid seed varieties. Evidently due to CORD's interventions and government promotions, most respondents utilize a vermicompost pit, the product of which is also used as fertilizer. In addition, farmers of Jadrangal use chemical fertilizers and pesticides to varying degrees as well as with organic methods. Most farmers have at least partially adopted the CORD-sanctioned system of crop intensification (SCI, Appendix B) in wheat and rice fields. All farmers asked irrigate most or all of their fields with the traditional *kuhl* mountain system of canals, though many cited issues and challenges with quality functioning of the system (Appendix B). Overall, farmers

in the area of study maintain agroecosystems that exhibit elements of both low-input, localized techniques and industrial, high-input ones.

IV. **Young People in Agriculture: *How* Are Young People Involved? Children Vs. Youth**

Children's meaningful involvement and contribution to household livelihoods is a precondition not only to successful transmission of traditional knowledge, but of overall self-worth. Children in Jadrangal are involved in agriculture by default; they experience the home life their parents have provided. Commonly, boys and girls do small amounts of light work, imitating what their parents, older siblings, or neighbors are doing, such as retrieving firewood, watering crops, or sorting seeds (JadrangalPanchayat, Field Observations, April-May 2013). Time spent around farm activity is generally a form of play. The young sons and daughters of a neighborhood in Manaal were observed chasing baby goats, retrieving items for older members of the community, and hanging around the elders in the polyhouse, who harvested French beans. Adults generally allowed them to "help" as they wished. Two farmers with young children stated that they do small amounts of work because it is enjoyable for them (Kumari, Raj, Farmer and wife, Personal Interview #19; Chand, Pavla Devi, Farmer, Personal Interview #14). One farmer mother of a ten-year-old son and twelve-year-old daughter said that her children are involved with farm work when they have time and do it for enjoyment, like "many other children of their age," (Chand, Pavla Devi, Farmer, Personal Interview #14). Overall, gendered division of involvement on the family farm was not observed for this age group.

Older adolescents and young adults were seen contributing much more extensively and directly to farm chores. Evidence of gender division of labor was also evident. In Manaal Village, school-aged teen boys (10^{th}-12^{th} Standard) during the potato harvest were seen doing

the “heavy work” of digging up soil with hoes to reveal potatoes (Personal Observation). Females, meanwhile, sorted and transported the potatoes in wooden baskets on their heads to their place of storage. Whereas adolescent boys in Manaal were seen only doing the hoeing, girls were seen doing many more activities like sweeping, cooking, cutting fodder, milking goats, carrying water, and sewing (Manaal Village Neighborhood of Balvinder Singh and family, Field Observations).

For farm families throughout the Kangra District, unsurprisingly, the knowledge and skills required to run a farm are clearly learned by *doing*. Manid Dhiman, a twenty-three year old with a local, low-level corporate job, and his brother, twenty year old, college-going Rajat Dhiman, are both sons of a farm family. They cited involvement in tasks from seed sowing and weeding to plowing and leveling. When asked detailed questions on their particular farm system, both sons provided detailed answers of FYM and vermicompost, *panchagavya,* and seed saving. They both stated adamantly that they felt they had the knowledge to run the farm themselves (Dhiman, Manid, Farmer’s son #10, Personal Interview). On the other hand, another farmer and mother of two sons, aged 14 and 17, Ms. Lalita Choudhary, stated that involvement in field work, like paddy transplanting, only occurs during school leave. She also said neither of her sons yet has the knowledge to run a farm themselves. Incidentally, Ms. Choudhary also stated that for her sons, the first priority is study in school (Choudhry, Lalita, Farmer #8, Personal Interview).

A. How Young People Don’t *Want* The Farm-Life and Why

The *ambition* to be involved in farming may be equally, if not more important to the future sustainability of agriculture and food procurement as the passing down of traditional knowledge. Onkar Singh of CORD Sidhbari Farm and Allied Sector summed up the situation of youth’s likelihood to do farming well when he said, “The farmer is manager, laborer,

multitasker, everything. There is no time limit. People do not want to *do* that," (Singh, Onkar, Farmer and Head of Farm/Allied Sector of CORD, Personal Interviews). Of all interview respondents in this study, just one farmer expressed that one of his two sons wishes to run his farm as a full time job (Pushpa & Desra, Farm Family, Informal Interview #2). All other interviewees (parents and male young people) responded that they either wish to work their land as "kitchen garden" and not for markets at all (Personal Interviews #8, 10, 11, 13, 16, 17, 19), sell only surplus (Personal Interviews #5, 9, 20), or that they want nothing to do with farming if they can help it.Participants of the farmer club focus group suggested that while the next generation will farm themselves, very few will do it full-time (Singh-Seni, et. al., Jadrangal Panchayat Ward #3 Farmer Club Focus Group/Discussion).

The phenomenonof part-time farming is an emerging trend throughout India and is based on size of household landholding (Sharma 2007), which is small for the majority of farmers in the study scope. For female youth, respondents suggested that her involvement in farming depends on the work of her husband's family. Analysis of discussion with and observation of female farmers points to the appearance that farmwork is an integral part of housework and that the business aspect is left to the men to deal with. This is also supported by the overwhelming male majority of members in the Farmer Club of Jadrangal Panchayat (Singh-Seni, et. al., Jadrangal Panchayat Ward #3 Farmer Club Meeting, Observation).

i. Alternative Goals

So, if young people of farmers do not wish to do the work of their parents, what *are* their intentions? The new Indian standard of a worthwhile and successful life includes years of formal education that will lead to a prosperous, secure, and comfortable career in the city (Sharma 2007). For many, it is a job in the formal sector in the government or business. (Personal Interviews #1, 2, 3, 4, 14, 15). The ubiquity of this dream has been confirmed by

respondents of this study. Of the 49 children and youth under age 30 asked directly or indirectly, 100% said that they go or went formal school training. Several farmer parents conveyed fixedly that doing well and completing schoolwork is the first priority before any participation in farm chores. Career goals cited by respondents include government job, engineer, teacher, and various jobs in business. Onkar Singh, who is now an advocate for farmer's livelihoods and wanted to get a government job out of school, suggested that there is an emphasis by parents and educators to get a "9-5 job" (Singh, Onkar, Farmer and Head of Farm/Allied Sector of CORD, Personal Interviews).

ii. Complex Factors Create the Future

At the same time so many farm parents want their children to have non-farm jobs, they are also aware of the potential family and community-level consequences if farming. One farmer who wants his son to have a government job also asked in frustration, "If the new generation is not coming forward to farm, who-all will grow? I don't know who will carry on land work after me," (Singh-Seni, Balbir, Farmer #1, Personal Interview). Another farmer expressed it matter-of-factly: "Young generation is not fond of agriculture but it's true there will be outside dependency if people don't do it." In general, farmers express pride and understanding of the value of their work, which includes bringing self-sufficiency and independence and good quality food to their families with their *own* hard work.

One farmer cited that those who drop farming have opportunities and those who stay behind have no opportunities (Bhatt, Piarchan Shokas, Farmer, Personal Interview#11). A young person voiced that farming is hard work, that there's no profit and not enough land, and that he only plans to kitchen garden because to let the land that his family has worked for generations become barren would be worse (Sharma, Parsadam (PR), Farmer, Personal Interview#13). Also, several respondents expressed concern that they or their children is a less appealing husband and may have trouble in procuring marriage arrangements(Singh,

Balvinder, Progressive Farmer, Informal Personal Interview; Personal Interview #12), pointing to a possible cultural stigma attached to agriculture as an occupation of the poor, common man. Alternatively, a member of a farmer's club offered a reason based more on human irresponsibility than external or cultural forces: that people are so money-minded or lazy that they merely complain about problems of farming but then do not get up and solve the problem themselves," (Singh-Seni, et. al., Jadrangal Panchayat Ward #3 Farmer Club Focus Group/Discussion).

1. Household Land Holding

A major barrier to the next generation's involvement in farming is the physical lack of enough land for farming to be a sufficient job—a result of overpopulation. Land holdings are patrilineally passed down over generations, from father to son. If a father has two or more sons, he often divides the land equally amongst his sons. More recently, this process has been affect by the increase in human numbers—what was once a feasibly big enough plot of one hundred kanals has been divided into just two and a half or five kanals, often not enough to support the family. It is helpful to isolate those farmers who have enough land to treat their farm as a business and compare their attitudes about farming as a worthwhile occupation to those that do not have enough. The reason for this is that for these farmers the variable of simply not holding enough land is accounted for. For children and youth of full-time farmers, they theoretically have more of an option to make farming their primary occupation.

Of all farmers interacted with, five said their primary work is farming. The smallest land holding amongst these farmers was 35 kanals. In Jadrangal, Mr. Ashwani Kumar was one of the *most* expressive about the importance of his children's education. His 11 and 13 year-old children almost never help in the field, remaining inside to study. Mr. PR Sharma, who holds 50 kanals of land and sells barley, wheat, and potatoes, expressed that his sons will

get a job first and then worry about growing food and working the land. Only one farmer claimed that his son is passionate about the farm work and plans to continue the farming (Pushpa & Desra, Farm Family, Informal Interview #2). The land these farmers hold have some of the most potential for their next sons and daughters to *remain* farmers (and carry on traditional knowledge) but some of these families seem *least* likely to continue farming as a serious enterprise. They seem most likely to downsize their farm to kitchen gardening for domestic production for the better quality food and exercise rather than for business. On the other hand, part-time farmers with very small plots have accepted the need for their children to obtain a non-farm primary occupation. One farmer claimed, "If there was enough land, agriculture would be the primary work of the family," (Choudhry, Bihari Lal, Farmer #9, Personal Interview). A prior study indicated that part-time farmers are often better educated, more skilled, and more likely to migrate out of farming but very unlikely to sell their land (Sharma 2007). Both pride and wishes for their child's success was exhibited by farmers in the field. This is supported by what can be described as a push-and-pull factor, causing farmers' children and youth to have the status of "betwixt and between" (Sharma 2007), where on one side the fading charm and lack of enough agricultural land drives him out of farming and on the other their local, traditional identity attracts them to stay on the path of their ancestors.

V. Traditional Knowledge and Youth's Importance: One Sustainability Gem Among Many

It is clear that a slew of complex factors are contributing to the slow decline of youth interest in farming and that the decline in youth interest is contributing to real and potential agricultural system degeneration. Indigenous agricultural knowledge acts as a distinct and highly relevant piece of the much larger agriculture system puzzle on which this relationship

acts. Its importance is vast but it is neither an end goal of sustainable agriculture nor the only method through which it can be reached. This study brought insight to the various indigenous techniques as well as knowledge behind those techniques. From the innately sustainable unity of plant and animal on the farm to the use of local plants like neem, eucalyptus, and mint for various benefits to the ancient system of *kuhl* (see Appendix B) irrigation maintained through community-wide efforts, farmers in the Kangra District continue to keep this traditional knowledge alive. Table #1 provides a full listing of the indigenous knowledge discovered in this study.

Table #1: Comprehensive List of *Indigenous* Knowledge/Techniques Gathered in the Study (In order of prevalence among farmers).

Technique	Description
Kuhl irrigation	Mountain system of irrigation—diversion of water from nearby mountain streams through canals called *kuhls*, utilizing gravity flow. Historically maintained communally, though use is thwarted due to development and maintenance-takeover by central government. See Appendix B.
Integrated "Agro-forestry"	Every farm exhibited an integration of fodder, fruit (mango, orange, guava), timber (bamboo), and firewood species located mostly near the home and near water sources but also dispersed throughout fields. Kept and maintained for their direct *human benefit* but also hold soil in place in hilly environment, slow water runoff, and purify air.
Farm-yard manure (FYM)	Nutrient-rich animal manure is spread on fields to maintain chemical, biological, and structural integrity of soil. Every farmer used FYM as a fertilizer, usually in addition to N-P-K chemical fertilizers such as urea.
Animal-integrated agriculture	Presence of animals (cows, bulls, oxen, goats, chicken, or sheep) decreases need for off-farm inputs. Animals promote biodiversity in their need for fodder. Bulls do heavy plow work, eliminating need for tractor. Animal waste is fertilizer, pesticide, and countless other uses. Most farmers had a cow at least.
Seed saving (at least partial)	The selection, collection, and storage of crop seeds from one season to next, eliminating dependence on outside companies. Most farmers did some seed saving but also purchased when needed or had better quality potential.
Panchagavya	Means five products of cow in Sanskrit and dates to Ayurvedic origin-special mixture of cow urine, dung, milk, curd, ghee, bananas, jaggery, and coconut water. See Appendix B.
Natural Seed/grain storage	Alternating layers of grain/seed with small layers of eucalyptus, mint, and neem, stored inside a wooden or woven container, sealed with cow dung.
Intercropping	Cultural method in which two or more crops are planted amongst each other for mutual benefit. Example: Green peas (a pulse) and wheat, though this particular intercrop is less common as pulses have

	decreased in Cited
Barbed-wire as Animal Control	Barbed-wire is strung around fields one time to effectively deter larger wild/domestic animals from crops. Observed at numerous farms in the field.
Use of Local Plants as Pest Control	Extract of *ghaniri*, walnut and tobacco leaves, lantana leaves (a toxic invasive species since 1809), neem leaves, *vichubutti* (stinging nettle), soapnut, and burning cow dung and rice husks (animals). Most not observed or mentioned by farmers—rather mentioned during CORD Ag. Sector Focus Group indigenous knowledge brainstorm.

So, how do youth's involvement (or lack of involvement) in agriculture contribute directly to the maintenance of this traditional knowledge? And to turn the question on its head, how can traditional knowledge contribute directly to the maintenance of youth's involvement in agriculture? Through three choice indigenous practices, this relationship can be illustrated.

A. Inherent Biodiversity: An Unspoken Intergenerational Transaction

Agriculture in mountain regions, by the very nature of the landscape, necessitates biodiverse systems. In most farms observed, people maintained many crop, tree, fodder, flower, and animal species, whose existence on a farm property are mutually beneficial for people's immediate subsistence and the surrounding environment's long-term sustainability. Entire faces of mountains cannot be deforested because they are crucial in preventing soil erosion and slowing water movement. By keeping such an array of domesticated plants and animals dispersed throughout the farm system, the smaller, but equally important insect and microorganisms have habitats. Whereas vast areas of flat plains are easily plowed, seeded, sprayed, and harvested by machine, hilly areas like the Kangra

Figure 2: Farm in Kangra District during *Kharif* season. Note the many visible tree species.

District have ancient terraced agricultural systems, “stairs” of land that follow the contours of the land (See Figure 2). Scientists have dated at more than one thousand years old. According to one farmer, no one knows exactly who carved the terraces from the mountains, it was ancestors of long ago. Steep areas have one main battle for agriculture: hills mean water runs toward nearest stream quickly. With cultivation, water brings the soil with it. “Trees keep soil still and slow down water,” said progressive farmer and development worker at CORD, Kamlesh.

A progressive farm family, headed by Mr. Kumar (Secretary of Farmer Club Ward #4) and Anita Diksheet who have one seventeen year-old son, Rajat, holds one of the most visibly biologically diverse pieces of land of the study. Countless crops, flowers, shrubs, weeds, herbs, fruit and fodder trees made up the kitchen gardening area. Except newly planted areas, every space was green. Birds could also be heard chirping in trees. Behind the home, their small cash crop terraced land had more trees dispersed throughout. Discussion with Mr. Kumar brought to light that their family hires labor, that his son exhibits negligible attention toward working the land, and that he wishes to be an engineer.

Just how do members of the family understand the biodiverse plot they’ve got going? When asked how farmers understand the importance of the biodiversity they maintain, one farmer and worker of CORD named Kamlesh stated that farmers understand it “in their own way.” Direct observation of day-to-day chores in the fields told that the knowledge, and transfer of knowledge, is in *action* and *need*, not academic sciences. The act of harvesting fodder for farm animals, for example, is a daily chore for almost every farm family. Pooja, an adolescent girl in Manaal Village, partakes in cutting weeds, oats, and established fodder grasses from the raised pathways of the potato fields. Rather than spraying weedicide, those species interspersed between areas of food and cash crops are a necessary component in her family’s farm system. Pooja may or may not articulate the importance of this practice with

terms like “biodiversity conservation,” rather, this is simply the way it works and must work. Her family needs milk and meat, so they have animals. Animals need food, so they have fodder integrated into the crop fields and keep the appropriate trees around (Manaal Village Neighborhood of Balvinder Singh and family, Field Observations).

B. Traditional Wild Animal & Pest Control: A Lost Art or Incomplete Story?

One aspect of this study that teases out significant points about famers’ understanding of her own knowledge is the use of local plants in pest control. Almost all farmers cited the utilization of chemical pesticides as their main form of pest control, though to varying degrees. When asked to identify what non-chemical methods farmers use, several farmers said they use the ancient concoction, *panchagavya (*see Table 1 and Appendix B), which acts as both fertilizer and pesticide, promoting soil fertility and repelling insects and disease. Formal research has shown *panchagavya* effectively controls banana wilt, tomato wilt, prevalence of cutworms, leafhoppers, and white flies (Yadav & Lourduraj 2002). One farmer cited the use of neem as a natural pesticide (Subhdra Devi, Farmer #6, Personal Interview) and another said he recently heard from another farmer that the pervasive lantana vegetation had pest-repelling properties and had decided to try it (Pushpa & Desra, Farm Family #2, Informal Interview). Secondary research actually shows that lantana is an invasive species introduced to India from Great Britain in 1809 and is today consider one of the world’s ten worst weeds (Prasad 2006). Overall, in interviews with individual farm families, eliciting deep conversation regarding specific traditional methods and their importance did not prove especially fruitful. Just five of twenty respondents reported the use of any natural pest control (traditional or otherwise).

This could be explained by a number of reasons. First, because farmers of Jadrangal, Jamanabad, and Malaan rely more on chemical weedicides, insecticides, and fungicides than

local or non-chemical methods, many no longer seem to hold extensive knowledge about this that can be, orally or through action, transmitted to their children. The intergenerational learning chain has already been broken to some degree in these communities by changing cultural attitudes shaped by influence of industrial, chemical agriculture. One farmer named Anooph described a how in the pre-chemical age ("the Old Days"), people did natural farming. There were only organic methods and there were few diseases. They left land fallow and rotated crops. He explained that the fertility of the soil was better but the production was in turn lower. The elders knew chemicals were harmful. He explained that today, farmers think that *more* chemicals equals better crop and those old techniques have been forgone. "They do not understand that excess can be harmful," (Anooph, Mr., Progressive Farmer, Personal Interview #15). Farmers have internalized the belief that because chemicals are products of scientific progress and because they are bought in a store, they are more valuable than the ways their parents and grandparents did things. With that, the next generation of children does not grow up witnessing, learning, and participating in the traditional techniques (because they are not being practiced in the first place) and children are kept away from pest control altogether becausespraying is a health hazard (Anooph, Mr., Progressive Farmer, Personal Interview #15). So, young farmers will value the ease and promises of chemicals in the same way.

There is more to the story, however. A focus group of CORD Farm and Allied Sector workers brainstormed an extensive list of local knowledge, including many biological and physical methods of control. Barbed-wire to keep wild pigs out of fields, scarecrows, extract of *ghaniri*, walnut and tobacco leaves, *vichubutti* (stinging nettle), soapnut, and burning cow dung and rice husks (animals) were all cited by the group. One member of the group also described his understanding of crop resistance: "There are the veg. [vegetarian] insects which eat and destroy the crops. Then there are our farmer friends the non-veg. insects that eat the

veg. insects. The chemicals kill *all* of them, not just the veg. ones!"(Kumar et al., Progressive Farmers and CORD Workers of District Kangra, Focus Group Discussion). It is clear that the knowledge *is* out there, but *why* weren't individual farmers mentioning any of this? It is probably partially attributable to flaws in the interview process and language barriers, but one young farmer shed light in another way. He said people do not mention these practices because they are *free*; since they are not bought from a store or started from a government program, those traditional techniques which are the theme of this study are not seen as worth mentioning (Kumar et al., Progressive Farmers and CORD Workers of District Kangra, Focus Group Discussion). Progressive farmers involved with CORD understand because the value of traditional techniques has been brought forth to their consciousness through teaching. In the same way farmers seem to hold vast knowledge of the maintenance of biodiversity without quite consciously realizing it, farmers who may in fact use a variety of traditional, non-chemical pest control methods do not articulate it in that way. In the modern era of scientists and specialists, value is no longer attached to the traditions. Regardless, if young people learn farming through *practice*, the farm system that is practiced dictates

C. Room for Innovation: New Methods of Knowledge Transfer for New Techniques?

While the transfer of traditional knowledge to children and the youth generation is crucially important, it is possible that some of the most economically and environmentally sustainable practices farmers use are in fact *not* based on local knowledge. Rather, they can come from recent innovations, sometimes perfected far from the western Himalayas. Two prime examples of this is the system of crop intensification, or SCI, and vermicomposting (See Appendix B). The majority of farmers cited trying out SCI at the recommendation of their farmer club or CORD in at least some of their plots. This method is a new alternative to

old methods of seed broadcasting, a male-dominated practice involving throwing seed across plots in a specific way to achieve best germination and yield. SCI has proven to increase non-hybrid wheat and paddy yields by 50-75% compared to seed broadcasting, save water, and decrease cost of seed (Sen et. al 2007). Interestingly, SCI was developed in Madagascar. In the present situation in which farmers must either grow a surplus on their land or have a second alternative income (therefore requiring the highest yielding technique), it would seem that the traditional method is not necessarily the best method. As a counterpoint, SCI is a more time and labor-intensive task, and for some farmers, increased yields may not be worth the time taken. (This may be why the much faster traditional seed broadcasting method was preferred in history.) Still, this example shows that there is room in agriculture for innovation and change.

Most farmers also cited utilizing vermicompost pits at the incentive of a government-subsidized program. Vermicompost utilizes earthworms to process farmyard waste, especially animal manure, into a chemically stable organic matter called humus, which improves soil structure, increases water and nutrient-holding capacities of the soil, and contains slowly-released nutrients to crops (Appendix B). This can be applied as a natural fertilizer on fields and contributes to a farm system less dependent on external inputs, once worms and pit structure is built. This method is not traditional or localized to this area of Himachal Pradesh, but seems to be quite beneficial with no negative consequences as of yet to people or land. The difference between this, and farmyard manure, is that it has taken a government initiative, rather than an ancient tradition, to promote it. So, while traditional knowledge has the tendency to be most sustainable, there are modern innovations out there worth practicing, worth passing down to the next generation.

i. The Story of Progressive Young Farmer, Parbesh Kumar

In this study, those farmers that did describe, use, and value indigenous methods of pest control had scientists and NGOs to verbalize and convey it. Prior to the Green Revolution, traditional farming practices simply were the way they were. Later they were understood as backwards when "modern techniques" came in. Today, the revival and acknowledgment of tradition's value is headed by institutions like NGOs. In this sense, traditional knowledge is being transferred in a way that contrasts and builds on traditional knowledge *transmission*, the intergenerational learning chain, proof that the chain has indeed been broken and that outsiders are piecing it back together. One example is progressive young farmer and CORD worker, Mr. Parbesh Kumar. He represents a unique case of farming in the Kangra District, consciously utilizing only indigenous and sustainable techniques of crop rotation, seed saving, intercropping, spreading of ash as fertilizers, use of various local plants, system of crop intensification, and more. He has learned from his father, mother, and grandfather the way of farming through being pushed to do many chores after school. His family's farm is big enough to be run as a business (15 kanals cultivated) and his father had taught him early in life that farming is a viable enterprise. This early understanding of the importance of growing food triggered an interest in most progressive techniques of farming that young Mr. Kumar later supplemented through speaking to and learning from other farmers and from sources of scientific proof (like CORD and affiliates). The case of Parbesh Kumar would signify that with early involvement, knowledge passed down from *somewhere*, and enough land, young people can be keenly involved in utilizing and sharing that knowledge as well as maintain a livelihood with farming.

The loss of traditional agricultural knowledge seems to be both a major cause and major consequence of this process. Industrial, conventional techniques of the Green Revolution first caused the intergenerational learning chain to break when farming stopped

becoming a way of life and started becoming an inconvenient necessity for food security. And now, the degree to which knowledge has been lost is contributing to the continued breakdown of the system

Analysis of Findings

No matter what degree children and youth of farm families in the Kangra District are involved in their agricultural system, it is clear that the very lifestyle of living off the land in the environment and structure inherent of this hilly area brings them to absorb the ebb and flow of agriculture effortlessly. They, for instance, naturally hold a lot more knowledge about traditional agricultural and are surely more likely than the average urban youth of Pathankot, Punjab to continue growing the nation's food into their adulthood. What Cruz-Garcia called "mother-child" nexus is indeed a global working phenomenon of knowledge transmission (Cruz-Garcia 2006). It is important to first recognize that despite problems facing this transmission process, it is indeed still alive. Traditional knowledge is not only understood in the mind. Traditional knowledge is ingrained in the mind of the grandmother's encyclopedia, in the seeds planted and precisely in our human muscle fibers that know just how to cut fodder from a tree and holding on tightly without a chance of falling. By managing resources, people manage the soil, plants, animals, and culture that supports them.

Overall, respondents were proud of the work they do. Many also understand that if people do not continue to farm, there will be dependency on the outside for food and loss of food security. However, as was noted earlier, in the end many still prefer that their children have easier, more profitable lives. How can such an inconsistency be? Surely there are there are a dynamic abundance of factors contributing to the loss of interest in agriculture. Land holding size, cultural stigma, lack of opportunity, anti-farmer policy, and bad markets contribute to the picture the farmer as a mere product of external forces. Agriculture as a

livelihood is, quite objectively, not a viable option for more and more people in India. However, respondents who offered human attitudes, like greed or laze, as reasons farming has lost popularityis. Perhaps unsurprisingly, those who cited these reasons were not farmers. Regardless, these were mildly reminiscent of a statement by Mahatma Gandhi. He once wrote, "The crisis affecting India in its agricultural sector, and other areas of economy, is not entirely structural. The problem is at its core a *crisis in human values*" (Pinto 1998). While the purpose of this study is not to delve into the philosophical underpinnings of human nature, it seems a potentially relevant issue to agriculture's future. Whereas Gandhi suggested self-reliance, simplicity, decentralization, truth, and the sharing of resources (including knowledge), the people interviewed did indeed seem to hold values that counter the maintenance of traditional knowledge or ensure this community's food sufficiency.

Most sons and daughters of farmers across all demographics in this study are unlikely to stay involved in farming. Perhaps another contributing factor to this is India's changing perception of the "good life", another result of globalization and western acculturation. One theory substantiates this: "In the course of childhood and adolescence, an individual is exposed to learning experiences that are of potential career relevance. These experiences are reinforced by activities that create a sense of efficacy and expectations about performance, which in turn influence the development of interests, aspirations, and the identification of achievable goals," (Lent el al., 1994). With Mr. Parbesh Kumar as a prime example, young people who are exposed to and positively reinforced by learning experiences on the farm in their youth are likely to development an interest in pursuing it as a career, provided the necessary materials to pursue it (namely *land).* It seems that for those in the Kangra District who now embrace the value of traditional methods, natural farming, and a bit of hard work have undergone a form of *unlearning* of cultural attitude.

On the other hand, when youth are kept from the presentation of agriculture as a viable option, it becomes very unlikely that agriculture will ever seem promising. Throughout history, farming has been viewed as poor, lowly, and physical work rather honorable, respectable, and based on a vast network of invaluable cerebral, social, and physical knowledge. This study was completed under the bias that growing the food that even the wealthiest humans survive on is the latter of these views.

With every child attending school today, the education system is also a major factor in whether agriculture is encouraging or discouraged. Indian education today does not seems to consider local resources, knowledge, and culture or present agriculture as a desirable career option in schools. Onkar Singh stated that the schooling system does not expose children to farming. The very livelihood that the area has depended on for millennia has been removed from youth's formal schooling, sending the message that their ancestors and grandparents had it wrong. One study on tribal children stated that knowledge erosion is explained through children's school attendance; the conventional structure of the educational system is not relevant to the lives of tribal children," (Cruz-Garcia 2006).

Eyssartier et. al sum it up well when they write, "…knowledge is a dynamic process, which generally responds in a flexible way to environmental and socio-cultural changes," Overall it is evident that in studying one aspect of farmers' issues in a small geographical locationunavoidablyconnects to the entire communities' issues, even the entire nation's issues. Traditional knowledge and youth's involvement has brought forth the relevance ofnational government schemes, cultural attitudes,environmental distress, economic issues, migration, education, and even right down to the very nature of the human experience. There is no question that traditional knowledge, specifically, will get passed down if youth are kept involved. Traditional knowledge is a mere piece of the puzzle of sustainable agriculture. The bigger question is—how is that puzzle being put together?

Conclusion and Way Forward

This study found that farmers in the scope of Kangra Distict are mostly small and marginal, practicing both natural and traditional methods (like inherent biodiversity) that contribute to economic, environmental, and cultural sustainability *and* industrial methods (like fertilizer and pesticide use) that weaken such sustainability. Children are involved in their family's agriculture by default, experiencing it generally in the form of play or small tasks. Older youth contribute meaningfully to daily or seasonal chores and this involvement showed to be gendered to some degree. All youth are involved to varying degrees depending on the family's prioritization of school work. Traditional knowledge and overall proficiency of farming is clearly transmitted mainly through action. While a few special cases arose, young people in this area generally wish to hold full-time nonagricultural positions and either avoid farming altogether or do kitchen gardening, preferring a secure job in the government or business sector. Presence or lack of enough land is a limiting factor to individual youth's wishes and it seems that farmers who do have a business are potentially less likely to want for their children to do the same work.Farmers are generally aware that the decline in agriculture in their communities can lead to various issues, but the reasons pulling youth away from agriculture seem to be stronger than that awareness.

Traditional knowledge is one aspect of what is preserved or lost depending on the future generation's involvement in agriculture and is the result of a slew of complex factors. Farmers seem to understand the biodiversity they maintain on their farms in terms of various species' household use-value and in terms of *need* rather than conventionally scientific terminology. Inadvertently, farm systems make much ecological sense. Since most farmers rely partially on chemical pest control, the intergenerational learning chain of traditional pest control may already have been broken to some degree, though it is still preserved in the minds of some. Knowledge that has been lost can be relearned with the motivation of

organizations such as CORD. Finally, traditional knowledge is not necessarily *always* the best option. As the system of crop intensification and vermicompost pits suggest, there is room for innovation even from the outside in sustainable agriculture.

A. Way Forward

As it is today, size of household land holding are likely to continue decreasing, with aging farmers continuing to divide their land amongst sons. With the present education system and overall cultural attitude toward farming, youth are likely to continue leaving the agriculture sector in search of more economically viable options. As Amrita Sharma stated in a study, "Unless farming becomes both intellectually stimulating and economically rewarding, it will be difficult to attract or retain rural youth in farming" (2007). To bring about intellectual stimulation and economic reward, two fronts of action seem appropriate.First the potential of livelihood improvement in the form of structural and technical progress is required. As stated earlier, outside entities like the government and NGOs must introduce innovative, nontraditional techniques (system of crop intensification, vermicompost, polyhouses, etc.) as well as revive indigenous ones. A merging and integration of both traditional techniques and products of modern science have the potential to complement each other in the most innovative, appropriate way for this century and this century's needs. As seen in the Kangra District, traditional methods of seed broadcasting have proven less appropriate at present than the new system of crop intensification. Traditional agricultural knowledge need not be treated as an end in itself. Rather, traditional knowledge must be valued and cultivated as a local *tool* to dynamically combat the global forces discouraging sustainable food systems. An integration of tradition and adaptation is the ultimate indication of a socially and ecologically resilient community.

Secondly, social inspiration is required amongst youth. Formal and informal education provides a platform through which both traditional knowledge can be taught and valued and young people can be given the options to choose to be farmers without a bias about certain jobs. Education must be more appropriate for the culture and environment of areas. Cruz-Garcia suggests that "a learning-by-doing approach counteracts social stigma and encourages learning among children of all ages and socio-cultural groups," (2006). One study has explored the linking of community wisemen with children in schools. Onkar Singh of CORD Sidhbari suggested school field trips as a way to integrate farming into school curricula. Youth are the perfect people to inspire with agriculture, lacking preconceived notions about farm stigma and hard work. They hold an enormous sense of curiosity which a demonstration of agriculture as viable can cultivate. They are truly going to pave the way for India in the coming decades.

B. **Room For Improvement and Challenges**

The completion of this study came with several challenges and upon reflection, room for improvement. Firstly, limited time was allotted for the independent study phase. Had the study period been longer, stronger rapport could have been built, more time could have been spent completing practice interviews, adjusting interview questions accordingly, and longer periods of time could have been spent in participatory observation, which proved to be the most telling form of research. Also, while basic Hindi was a window to connecting with respondents, the need for a translator and lack of English-fluent translator posed a challenge in building rapport with respondents, which potentially prevented even more fruitful discussion. One important example of this is the terms *indigenous* and *traditional.* In my speech, I use these terms interchangeably. However, for my translator, only *indigenous* was understood in the way meant. Next, due to timing of field days, a participatory focus group

held with women in Jadrangal was not completed. Therefore, conclusions about perceptions of youth in agriculture and traditional agricultural knowledge based on gender could not be made. Further, it is important to acknowledge the research bias associated with this study. As a student of sustainable agriculture, I unavoidably carry beliefs in the importance of this form of farming. And, as a foreigner to the area of research and newcomer to research, lack of poise, culture fatigue, and fear of disturbing respondents in their homes are all personal things to work on in future research.

New Questions and Recommendations for Further Study:

Overall, systems-thinking approach to researching social aspects of agriculture seems most appropriate. An integration of social science, agriculture and ecological science, and even moral philosophy can provide a more real understanding of issues farmers face and how to realistically bring about radical and morally sound change. An economically viable farm and ecologically thorough model are necessary—and traditional knowledge plays a role here—but even bigger questions were raised in the process of this study that deserve further attention:

- What cultural values related to agriculture are the next generation being raised with?
- *Should* a single program of formal education be considered appropriate for an entire nation's diverse ways of life?
- What form does education take in the Kangra District? Just what do schools tells children about "the good life"? How does education promote the migration of young people to nonfarm employment? What form *should* education take in the Kangra District or in Himachal Pradesh?

Proponents of alternative education might suggest that such a schooling system is inappropriate for an agricultural, land-based area but others would stress that youth should be presented with knowledge needed for all possible career paths. A feasible future study in Himachal Pradesh could be formal education's effect on the next generation of farming in

Himachal Pradesh; just what do schools tell children about “the good life”? How are they promoting the migration of young people away from farming as a viable?

Also, the effectsof the public distribution system (PDS) on farmers in District Kangra quickly became apparent during interviews—they claimed that cheap grain imported from outside states hugely decreases the ability and incentive for farmers to grow and sell their own grain, which costs much more. Further exploration into government scheme’s effects on farmers in this area would likely prove fruitful. At the recommendation of Mr. Onkar Singh of CORD: Sidhbari, Himachal Pradesh needs a quantitative study of exactly how much surplus grain farmers grow each season, so the government can change policies so that the first priority is on the state’s PDS grain self-sufficiency, only importing the deficit from the outside. Further qualitative studies focusing on farmers’ experiences and participatory government policy change to be more farmer-friendly would also be helpful, including the new Rural Employment Guarantee Act, which farmers mentioned were affecting the proper maintenance of their *kuhl* irrigation systems.

Appendix A: Semi-directed Interview:

The following questions were brought into the field. Questions were not asked in a linear format, rather as interviewer I went into field with goals of answering thematic questions and having detailed questions if the interview came to a lull, but allowed unanticipated answers to lead elsewhere as seen fit.

Parents

Thematic Question #1: What is the farm system picture?

1. What crops do you grow? Why?
2. Do you farm for domestic consumption, sale, or mixed?
3. Is farming the primary income or secondary?
4. Do you use chemicals to fertilize soil or control pests?
5. What biological and non-chemical methods do you use to keep soil healthy?
6. From where do you get your seed? (if saved, do children help?)
7. What is the source of water for the field?
8. What farm animals do you have?

Thematic Question #2: How did you learn the farm system?

9. Were your parents full-time farmers?
10. From whom did you learn skills and knowledge of farming?

Thematic Question #3: How are the children involved?

11. Do your children attend school?
12. What farm-related chores does your daughter/s do?
13. What farm-related chores does your son/s do?
14. What time of day and in which seasons?
15. Does your daughter have the knowledge to run a farm herself?
16. Does your son have the knowledge to run a farm himself?
17. Do you *want* any of your children to be farmers? Why?

Thematic Question #4: How is the knowledge being transferred to young people?

18. How did your children learn the knowledge about farming?

Thematic Question #5: Why is this important?

19. How is farming important to you?
20. Are you proud of being a farmer? Why/why not?
21. What will happen if your sons and daughters do not farm?
22. Who will grow the food for this panachayat/area if many less people in the next generation continue with farming?

Questions for Adult Youth

Thematic Question #1: Do young people know as much as his parents?

1. What practices do you use to fertilize soil or control pests?

2. What biological and non-chemical methods do you use to keep soil healthy?
3. From where do you get your seed?

Thematic Question #2: How are they involved/how do they spend their time?

4. Do you attend school or have another job? Are you married?
5. What farm-related chores did you do growing up?
6. What time of day and in which seasons?
7. How did you learn the knowledge about farming?

Thematic Question #3: What are perceptions on farming as a viable form of employment?

8. Do you think you have the knowledge to run a farm yourself?
9. Do you want to be farmer in your future?
10. Where will you get your food if you do not farm?
11. Why is growing food important, in your opinion?
12. Who will grow the food for your family if people of your generation do not continue farming?
13. Are you proud to come from a farmer family? Why/why not?

Questions for Grandmother/father

1. Were your parents farmers?
2. Did they have any other jobs or only farming?
3. How is the farm system of your family different today than when you were young?
4. How did your parents control farm pests ? Chemicals?
5. How did you parents conserve soil and fertilize?
6. Did your family save seed when you were young?
   How did they choose which seeds to save?
7. Are there any traditional farm methods that were passed down for many generations to you?
8. Do your children use the same farming traditions?
9. Why is growing food important, in your opinion?
10. Are you proud to come from a farmer family? Why/why not?

Appendix B: Glossary of Hindi Terms and Agricultural Terms

Intercropping: cultural method of planting two or more crops in the same space, utilized for its mutually beneficial properties for both crops, related to pest control, nutrient provision, disease resistance, or physical support.

Kanal: unit of measuring land area, used by farmers in northern India. Equal to 506 square meters, or 1/8 acre, or 0.051 hectares

Kharif & *ravi* crop: *Ravi* crops refer to crops sown in winter and harvested in the summer season; the spring harvest on the Indian subcontinent. Includes wheat, barley,

mustard, and peas. The *kharif* crop starts with the onset of the monsoon season, when crops are sown and ends with harvest around October. Major *kharif* crops include paddy and millet.

Kuhl: Mountain system of irrigation—diversion of water from nearby mountain streams through canals called *kuhls*, gently traversing the contours of a mountain slope utilizing gravity flow. In 1994-95, *kuhls* irrigated about 84% of the net irrigated area of Himachal Pradesh. Traditional *kuhls* start from a temporary diversion structure in a stream bed with a dug-out earthen main channel, a few hundred to few kilometers long. Then numerous distribution points and field channels are followed. Their engineering simplicity and use of locally available materials enabled village communities to construct thousands in the central western Himalayas. During rains, temporary diversion structures are built with locally available materials like boulders, brushwood, and branches. Historically maintained communally, though use is thwarted due to development and maintenance-takeover by central government (PSI 2003).

Panchagavya: In Sanskrit, means "blend of five products from cow". Known to be traditional and Ayurvedic in origin and exhibit pesticidal and fertilizer properties. Made from a special mixture of cow dung, urine, milk, ghee, curd, and coconut water. Each ingredient contains unique biological and chemical properties that work together on fields and crops. Use a correct times has shown insurance of continuous flowering, increase in fruit yields, resistance to pests and diseases, and a quickened paddy harvest. It has also been seen to restore yield levels of all crops during the transitory period from an inorganic system to an organic one. It has also been shown to control banana wilt, tomato wilt, reduce cutworm effects as well as leafhopper and white fly. (Yadav & Lourduraj 2002).

SCI: System developed in Madagascar over twenty years of research, based on traditional methods elsewhere in the world. Involves individual seeding and transplanting of rice or wheat in linear rows with adequate spacing, so as to increase yield, decrease water needs, and decrease cost of seed. CORD Sidhbari is promoting it extensively across the Kangra District.

Vermicompost: Natural soil amendment retrieved through worm-facilitated compost. Farmyard scraps and dung can be thrown into a compost pit of worms and within a few weeks, worms digest the waste, leaving behind a dark, nutrient-rich material called humus. With correct care, vermicompost is an easy way to natural amend fields. Himachal Pradesh government is promoting it extensively but poor implementation is seeing incorrect use of the pits.

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Figure 2. Courtesy of CORD Sidhbari.

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